

Ingrown toenails: digging out the facts

The best method for treating patients with an ingrown toenail has long been debated. Non-surgical options are generally preferred for patients with mild-to-moderate symptoms, and surgical options preferred in patients with more severe symptoms. However, there is limited evidence available regarding the effectiveness of non-surgical treatments. Recent evidence suggests that some surgical techniques are associated with very low recurrence rates of the ingrown toenail, and therefore should be considered more often, despite being a more invasive treatment.

Ingrown toenails primarily affect younger males

Ingrown toenails, also known as onychocryptosis or unguis incarnates, are a painful condition due to the sides or corner of the toenail digging into the surrounding soft tissue. This results in a breach of the underlying skin and leads to pain, inflammation, formation of granulation tissue, and in some cases infection. The most commonly affected area is the lateral edge of the great (big) toe, although the medial edge and other toes can also be affected. Ingrown toenails most frequently occur in males aged 15–40 years.¹ It has been reported that approximately 20% of patients who present to their general practitioner with foot problems will have an ingrown toenail.²

The exact causes of ingrown toenails are still being debated

A number of intrinsic and extrinsic factors (see over page) have traditionally been linked with the development of ingrown toenails. However, there is a lack of quality evidence supporting a single mechanism and ingrown toenail development may be triggered by multiple factors. There is ongoing debate about whether factors relating to the nail itself are responsible for the condition or whether the size and shape of the surrounding periungual nail folds are the cause (Figure 1).³

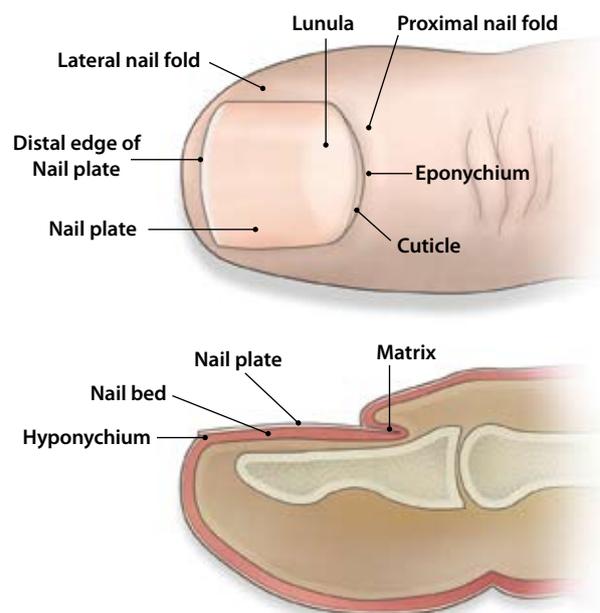


Figure 1: Structural anatomy of the toe and toenail

Factors traditionally associated with the development of ingrown toenails, and supported by varying degrees of evidence, include:^{2,4}

- Inappropriate nail trimming which can cause the corner of the nail to dig in to the surrounding skin (see: "Toenail cutting –advice for patients", see opposite)
- Tight or narrow footwear which can compress the toes and result in changes in the shape of the toenail
- Hyperhidrosis and poor foot hygiene
- Onychomycosis (fungal nail infection)
- A family history of ingrown toenails
- Repetitive trauma, e.g. running, kicking or stubbing of the toe
- Abnormally shaped nail plates or nail folds
- Diabetes and obesity
- Thyroid, cardiac and renal disorders
- Some medicines, e.g. retinoids, oral antifungals, ciclosporin and docetaxel (an IV chemotherapy medicine)

Treatment of ingrown toenails includes non-surgical and surgical options

Patients with an ingrown toenail most frequently present with pain, redness and swelling, the severity of which depends on the stage of the ingrown toenail (Table 1) and whether any infection is present. Although clinical staging of an ingrown toenail is not always necessary, being aware of the different stages can help in selecting the most appropriate treatment.

Diagnostic tests are not usually required, but if a particular cause is suspected appropriate tests can be ordered, e.g. nail clippings and scrapings of subungual debris for fungal culture and microscopy.

When deciding on the most appropriate treatment method to manage a patient with an ingrown toenail a number of factors need to be taken into consideration, including:

- The severity of the pain and inflammation and if infection is present
- Whether the patient has previously presented with an ingrown toenail

Table 1: Stages of ingrown toenails (adapted from DermNet NZ, 2013)⁴

Stage		Clinical features
One (mild)		Erythema, mild oedema and pain (especially when pressure is applied to the lateral nail fold) with no pus or drainage
Two (moderate)		Increased erythema, oedema and pain which may be associated with white or yellow coloured pus or drainage from the area. Lateral nail-fold hypertrophy becomes apparent.
Three (severe)		Further increase in erythema, oedema and pain with formation of granulation tissue which can add to pus formation and more significant infection. Lateral nail-fold hypertrophy is more prominent.

Images kindly supplied by Dr Daniel Poratt

- What treatments have been previously tried and if the treatment was successful
- Patient preference and co-morbidities, e.g. some people may not like the cosmetic results of surgical options and people with certain co-morbidities, e.g. diabetes, may not be candidates for some surgical treatments

In general, conservative treatments can be trialled in patients with a first presentation of an ingrown toenail with mild symptoms, in those who do not want to have surgery and in those at an increased risk of surgical complications. Patients with more severe symptoms or with an ingrown toenail that has not responded to conservative treatment can be considered for surgical options.

A 2012 Cochrane review reported that surgical interventions are generally more effective in preventing recurrence of an ingrown toenail than non-surgical treatments.⁵ However, the review did not define which stages of ingrown toenails were included in the trials and the results are likely to be more applicable for patients with a moderate-to-severe ingrown toenail.

Conservative options can be tried in patients with mild ingrown toenails

There are a number of general measures and conservative treatments that can be considered in patients with a mild ingrown toenail.

General measures: May not “cure” the ingrown toenail, but can provide symptomatic relief and prevent the ingrown toenail from becoming infected or progressing to the next stage. The following can be considered:⁴

- Gently lifting the nail and removing the spicule (small spike at outer margin of nail plate) that is digging in to the surrounding soft tissue (if the patient has not already tried this or has not performed the procedure effectively)
- Treating any underlying pathogenic factors, e.g. confirmed fungal infection, hyperhidrosis
- Applying silver nitrate to cauterise the granulation tissue and reduce the skin fold bulk. This can, however, be a slow process and it may be more effective to remove the granulation tissue later if surgery is undertaken.
- Cleaning the area with hydrogen peroxide or iodine solution to slow or stop the growth of micro-organisms
- Instructing the patient to gently massage the inflamed area at night

Toenail cutting – advice for patients

Inappropriate toenail trimming is associated with the formation of ingrown toenails and conventional advice to prevent this is for toenails to be cut straight across rather than curved.⁵ However, this advice has been challenged more recently. A study that investigated two different surgical techniques in patients with an ingrown toenail reported that the toenail cutting method (straight vs. curved) was not a significant factor in ingrown toenail development.⁶ The overall shape of the nail is determined by the growing area at the nail matrix.

Patients can be advised to:

- Cut their toenails either straight across or with a gentle curve, taking care not to cut too deeply down into the corners of the nail; podiatry grade clippers may be required to cut tough, thick nails
- Use a nail file to prevent jagged edges and create a smooth, rounded edge. A Black’s file (a thin file designed to clear debris from the nail sulcus [gutter] and file the edge of the nail) can be recommended as the thin design helps to access difficult to reach areas, e.g. the spicule

Patients with mobility or flexibility problems or very thickened nails may need to be referred to a podiatrist for nail cutting.

- Educating the patient about wearing appropriate footwear that fits well and does not result in excessive bunching of the toes, e.g. wearing shoes with a wide toe box or open toe

People with a fungal toenail infection have an increased risk of developing an ingrown toenail as the fungal infection causes the toenail to become thickened. Patients often require treatment with an oral antifungal, e.g. terbinafine or itraconazole, or a topical antifungal, e.g. amorolfine or ciclopirox, in combination with the ingrown toenail treatment.

 For further information, see “Management of fungal nail infections” BPJ 19 (Feb, 2009).

Antibiotics: The use of antibiotics in patients with an ingrown toenail appears to be primarily based on historical practice and there is limited clinical trial evidence supporting their routine use.^{2,7} Antibiotics may be considered when a patient presents with obvious signs of infection, e.g. erythema, pus and some evidence of extending cellulitis, especially if the infection extends beyond the nail fold. However, it can be difficult to differentiate between infection and non-infective inflammation. If it is decided that antibiotics are warranted, the antibiotic selected should have cover against *Staphylococcus aureus*, e.g. flucloxacillin, as this is the bacteria most commonly associated with nail fold infections.²

Antibiotics have also traditionally been prescribed to reduce any infection prior to surgery. However, it has been reported

that once the ingrown part of the toenail has been surgically removed and chemical matricectomy with phenol performed, the localised infection/inflammation resolves without the need for antibiotics.² Antibiotics are also not routinely required when the surgical treatment targets the surrounding skin folds.⁸

Non-surgical treatment strategies

There are a number of non-surgical options available that target either the ingrown toenail itself or the surrounding nail folds. The aim of conservative treatment is to separate the ingrown part of the toenail from the surrounding nail fold. The cotton wick method is the most commonly performed of these methods in general practice.

The cotton wick (packing) method: Involves elevating the lateral edge of the toenail and inserting a small piece of cotton wick (which can be soaked in disinfectant or antiseptic) under the edge of the nail to prevent it digging in to the surrounding tissue (Figure 2).⁴ The procedure can generally be performed without the use of a local anaesthetic. If necessary, silver nitrate can be used to cauterise any surrounding granulation tissue. Be aware that silver nitrate is corrosive and stains both the toenail and surrounding tissue black. Patients usually report immediate relief of pain after the procedure. The patient can be instructed to repeat the process once, or if necessary, twice daily, or if the cotton falls out. It is generally recommended that the cotton wick only remain in place for approximately one week as distal subungual onychomycosis can develop if the cotton wick is left in for a prolonged period.

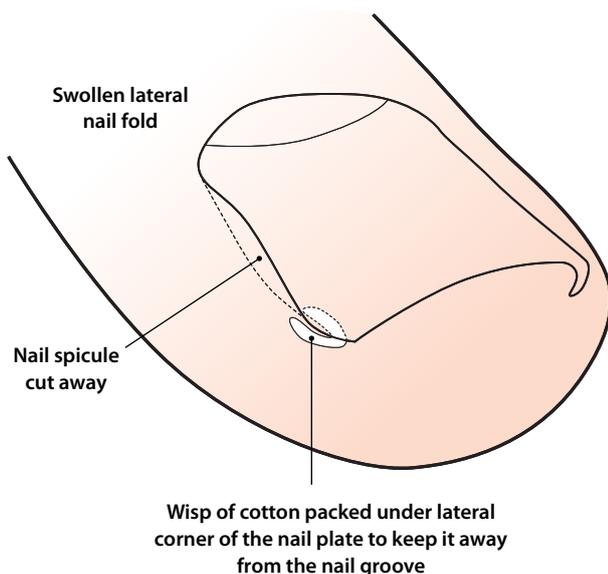


Figure 2: The cotton wick (packing) method

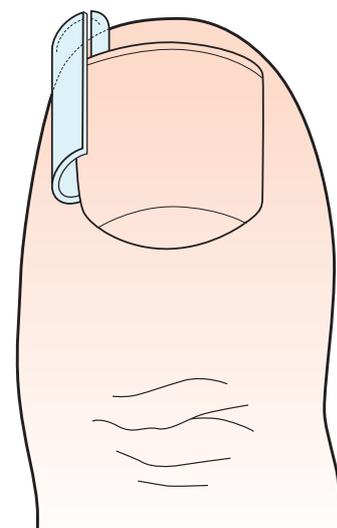


Figure 3: The gutter splint (sleeve) technique

Dental floss technique: This technique is similar to the cotton wick method except that a string of dental floss is used to separate the toenail and the nail bed rather than a cotton wick. The dental floss is inserted obliquely under the corner of the ingrown toenail and pushed proximally. The procedure is usually performed without a local anaesthetic. It has been reported that patients experience immediate relief of pain, followed by growing out of the spicule without injury to the nail fold.⁹ The dental floss is usually left in place until the lateral anterior tip of the of the nail plate reaches the hyponychium (Figure 1).⁹ The dental floss should be replaced if it becomes dirty or falls out before this occurs.

The gutter splint (sleeve) technique: A small sterile plastic tube, most commonly from an IV line, is split lengthways (with a diagonal cut on one end to aid smooth insertion) and inserted under the lateral edge of the nail (Figure 3). The nail corner and lateral edge of the nail is lifted and the “gutter” slid down so that it rests between the nail and the underlying soft tissue. A local anaesthetic is required when performing the procedure.¹⁰ The gutter can be fixed in place with adhesive tape, sutures or an acrylic resin. The gutter splint can then be covered with an appropriate dressing to stop it catching on clothing and bed sheets. The length of time the gutter is left in place depends on the time required for the normal nail to grow over the tip of the toe and can range from two weeks to three months.² The technique has been reported to be highly effective – one study reported no recurrences in 62 patients who underwent the procedure.¹⁰

Taping method: This technique is the least invasive of all the conservative non-surgical treatments and uses an adhesive elastic tape, e.g. strapping tape (approximately 15 – 20 mm wide and 5 cm long), to pull the lateral nail fold away from the ingrown toenail (Figure 4).⁷ One end of the elastic tape is placed against the ingrown nail alongside any granulation tissue (if present) and then wrapped around the toe so that the other end overlaps the first without covering the toenail.¹¹ The exact taping technique is crucial and patients will require specific instruction about how to perform it.⁷ It is generally recommended that the affected toe is re-taped every three to seven days (or when the tape becomes ineffective) for at least two months.

Orthoxyia (brace technique): This technique uses a small metal brace to pull the edge of the ingrown toenail away from the underlying soft tissue, after removal of the spicule. However, these braces are not readily available in New Zealand. A study that investigated nail bracing in patients with an ingrown toenail reported that all 12 patients were pain-free after six to 10 months of treatment.¹³

Angle correction technique: This technique aims to correct the convex nature of the toenail by filing the entire surface of it with the intention of decreasing its thickness by 50–75%. The process is then repeated by the patient every two months making the nail thin and soft which reduces the pressure on the nail fold. A Blacks file (a specialised nail file – see “Toenail cutting”, Page 27) can then be used to reshape the edge of the nail. Patients need to be educated about the importance of not removing too much of the toenail as this can result in pain when pressure is placed on the nail.

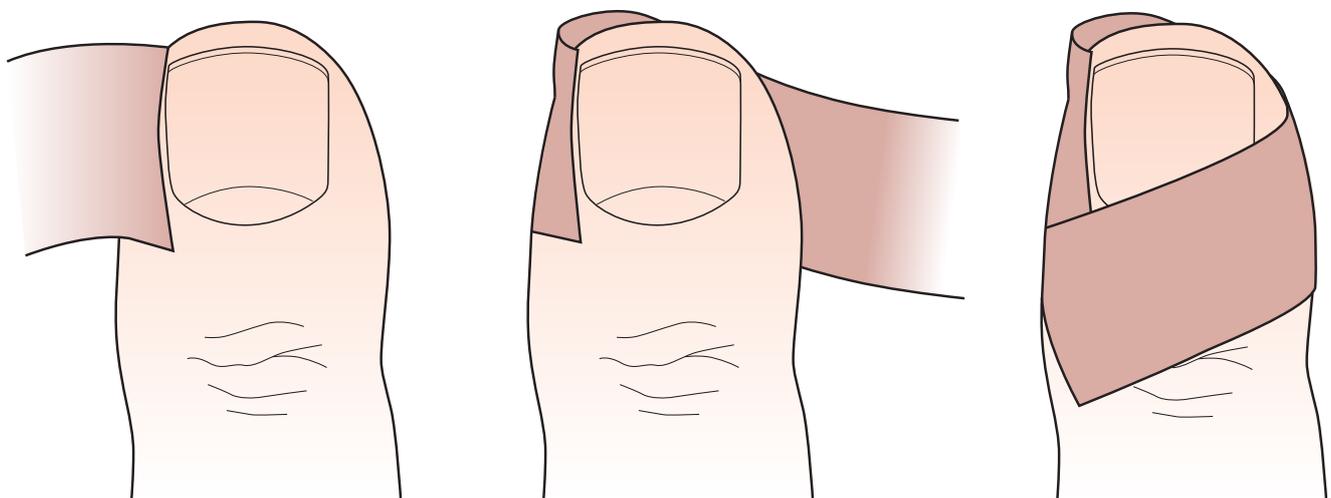


Figure 4: The taping method

Surgical treatment options: techniques target either the nail or the soft tissue

Most surgical techniques for correcting an ingrown toenail are variations of two different approaches which either target the nail plate itself or the lateral skin folds that surround the toenail. Surgical treatments have traditionally focused on the nail as the causative agent, and the most commonly performed procedure is the “wedge resection” technique that involves partial removal of the toenail with segmental phenol ablation (see below).⁵

Recent evidence suggests that a surgical technique that targets the nail folds and leaves the toenail intact (based on the “Vandenbos” technique, see opposite) should be considered more often, as very low recurrence rates have been reported.⁸

Surgical treatments that target the toenail

There are a number of different techniques that target the toenail. Most are variations of the widely used “wedge resection” technique which involves removal of the affected margin of the ingrown toenail. After avulsion of the affected portion of the toenail, destruction of the nail matrix prevents that part of the nail re-growing (therefore permanently reducing the width of the toenail). There are a number of methods used for destruction of the nail matrix including liquefied phenol (90%), sodium hydroxide (10 – 20%), surgical dissection, diathermy, electrocautery and carbon dioxide laser. Of these, phenol is the most commonly used and has been shown to be effective in preventing recurrence.⁵

Partial nail avulsion (wedge resection) with segmental phenol ablation

This procedure is performed under a partial ring block with 1% plain lidocaine injected at the base of the toe. As the major innervations to the nail plate are the plantar digital proper nerves, the majority of the local anaesthetic should be placed on the plantar aspect of the digit. A three-sided ring block is recommended as a four-sided block is associated with a risk of ischaemia.¹⁴ A ring tourniquet is applied to the toe followed by longitudinal removal of the outer part (usually 3 – 5 mm) of the affected toenail, including the nail matrix. Segmental ablation of the exposed toenail matrix is then performed using liquefied phenol. There is some debate about the length of time that the phenol should be applied for, but two 60-second applications appears to be most widely used.¹ Other studies have reported that phenol only needs to be applied for 60 seconds in total, which can be split into three 20 second applications.¹⁵ The applications should be separated by a washout with saline (alcohol is often used but is unnecessary) and this should be

repeated after each application of phenol.¹ The area should be dried with a cotton wool swab prior to each application of the phenol to reduce the chance that the phenol will be diluted with blood or saline.

Postoperative care: The patient should be advised to keep their leg elevated for 24 – 48 hours while seated and avoid wearing a shoe on the affected foot for approximately three days. Antibiotics are not routinely required as it has been reported that postoperative antibiotic prophylaxis does not reduce the rate of postoperative infection or recurrence of the ingrown toenail.^{5,6} The patient can remove the dressing on the day after surgery and soak the affected foot in warm water containing Epsom salts, twice daily, for approximately one week. Table salt (one to three tablespoons per litre of water) can be used as an alternative to Epsom salts. Patients may require analgesia, e.g. paracetamol +/- codeine or ibuprofen, for two to three days. Follow-up check of the site at one week is recommended (Figure 5).

The recurrence rates following this procedure vary from 1 – 14%.^{6,7} A 2006 randomised study that compared partial nail avulsion with or without phenol ablation of the matrix reported that the one-year recurrence rates were significantly lower when phenol ablation was used (14% vs. 41%).⁶

This technique can be performed in patients with diabetes as it is not contraindicated in the presence of an impaired arterial blood supply.⁷ The procedure can also be used safely in children (although it is rarely performed), usually after conservative treatments have failed.⁷



Figure 5: One week after partial nail avulsion and phenolisation (Image supplied by Dr Daniel Poratt)

Longitudinal band method

This technique involves longitudinal removal of the middle 4 – 5 mm of the affected toenail as far back as the skin at the base of the toenail, i.e. the most distal portion of the nail and nail matrix are left intact. Although limited clinical trial data are available for this technique, the advantages appear to include low recurrence rates (approximately 2%) and minimal limitation of daily functioning.¹⁶

Total nail avulsion not recommended

Total removal of the nail without phenol ablation is not recommended because overall recurrence rates of approximately 70% have been reported in a number of studies.⁸ Total removal of the nail with matricectomy is generally considered to be an obsolete technique.⁷

Surgical treatments that target the lateral nail fold

Surgical techniques that target the lateral periungual soft tissue nail fold were first described by Vandenbos and Bowers in the late 1950s.¹⁷ Recent research suggests that the “Vandenbos” technique results in very low or “zero” recurrence rates (see below) and provides an alternative surgical option for ingrown toenails.^{8, 18}

Excision of the nail fold (based on the Vandenbos technique)

This procedure involves extensive removal of the periungual nail fold while leaving the toenail itself intact. The procedure is performed under a three-sided ring block of the affected toe and involves making a large elliptical incision on each side of the nail and removing the relevant lateral skin folds. It is important that the excision is generous and adequate (leaving a soft tissue deficiency of approximately 1.5 × 3 cm). Light cauterisation with either silver nitrate or electrocautery is then performed and the wound is left to heal by secondary intention.⁸ A gauze dressing should be applied.

Postoperative care: The patient should be instructed to remove the gauze dressing after 48 hours and to soak their feet in a warm water bath containing Epsom salts for 15 – 20 minutes.¹⁸ Table salt (one to three tablespoons per litre of water) can be used as an alternative to Epsom salts. A new dressing can then be reapplied and the procedure repeated up to three times a day for the next four to six weeks, although patients are often not adherent with this.⁸ Paracetamol +/- codeine or ibuprofen are usually sufficient for pain relief in the immediate postoperative period. Antibiotics are not routinely required.¹⁸ Ideally, the patient should be followed-up after two weeks. The wound should be healed after four to six weeks with the nail sitting above the surrounding soft tissue.¹⁸

Two studies that examined the Vandenbos-based technique reported no recurrences of ingrown toenails after the procedure, no cases of osteomyelitis, and high rates of patient satisfaction due to good cosmetic results.^{8, 18}

N.B. The Vandenbos technique is not recommended in patients with diabetes as poor blood supply can delay healing. Partial nail avulsion with phenol ablation is recommended in these patients.

 Instructional videos for many of the surgical procedures for treating ingrown toenails can be found on YouTube.

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